

## CLAIMS

We claim the following:

1           1.    A method of stimulating the production of hematopoietic  
2 cells in a patient comprising the step of administering a  
3 polypeptide to the patient wherein the polypeptide is a human  
4 flt-3 receptor agonist polypeptide comprising a modified flt-3  
5 ligand amino acid sequence selected from the group consisting of:

6           (i)     the sequence of SEQ ID NO: 144; and

7           (ii)    a polypeptide comprising residues 1-132 of SEQ ID  
8                   NO:144;

9 wherein the modification comprises the linear rearrangement of  
10 the sequences of (i) or (ii); wherein the N-terminus is joined to  
11 the C-terminus directly or through a linker capable of joining  
12 the N-terminus to the C-terminus and new C- and N-termini are  
13 created between the amino acid residue pairs of SEQ ID NO:144  
14 selected from the group consisting of:

15           28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

16           38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

17           87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

18           95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

19           and 102-103; and

20 wherein optionally the flt-3 receptor agonist polypeptide is  
21 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
22 (methionine<sup>-2</sup>, alanine<sup>-1</sup>).

2. A method of stimulating the production of hematopoietic cells in a patient comprising the step of administering a composition to the patient wherein the composition comprises a pharmaceutically acceptable carrier and a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or (methionine<sup>-2</sup>, alanine<sup>-1</sup>).

1           3.    A method for selective ex vivo expansion of stem  
2 cells comprising the steps of:

3           (a)   separating hematopoietic cells from other cells;

4           (b)   culturing the separated hematopoietic cells in a  
5 culture medium comprising a human flt-3 receptor agonist  
6 polypeptide comprising a modified flt-3 ligand amino acid  
7 sequence selected from the group consisting of:

8           (i)    the sequence of SEQ ID NO: 144; and

9           (ii)   a polypeptide comprising residues 1-132 of SEQ ID  
10                   NO:144;

11 wherein the modification comprises the linear rearrangement of  
12 the sequences of (i) or (ii); wherein the N-terminus is joined to  
13 the C-terminus directly or through a linker capable of joining  
14 the N-terminus to the C-terminus and new C- and N-termini are  
15 created between the amino acid residue pairs of SEQ ID NO:144  
16 selected from the group consisting of:

17           28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

18           38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

19           87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

20           95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

21           and 102-103; and

22 wherein optionally the flt-3 receptor agonist polypeptide is  
23 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
24 (methionine<sup>-2</sup>, alanine<sup>-1</sup>); and  
25 (c) harvesting the cultured cells.

1           4.    A method for selective ex vivo expansion of  
2 hematopoietic cells comprising the steps of:

3           (a) culturing the hematopoietic cells in a culture medium  
4 comprising a composition including a pharmaceutically acceptable  
5 carrier and a human flt-3 receptor agonist polypeptide comprising  
6 a modified flt-3 ligand amino acid sequence selected from the  
7 group consisting of:

8           (i)     the sequence of SEQ ID NO: 144; and

9           (ii)    a polypeptide comprising the residues 1-132 of SEQ  
10 ID NO:144;

11 wherein the modification comprises the linear rearrangement of  
12 the sequences of (i) or (ii); wherein the N-terminus is joined to  
13 the C-terminus directly or through a linker capable of joining  
14 the N-terminus to the C-terminus and new C- and N-termini are  
15 created between the amino acid residue pairs of SEQ ID NO:144  
16 selected from the group consisting of:

17           28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

18           38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

19           87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

20           95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

21           and 102-103; and

22 wherein optionally the flt-3 receptor agonist polypeptide is  
23 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
24 (methionine<sup>-2</sup>, alanine<sup>-1</sup>); and  
25 (b) harvesting the cultured cells.

1           5.    A method for selective ex vivo expansion of  
2 hematopoietic cells comprising the steps of:

3           (a)   separating hematopoietic cells from other cells;

4           (b)   culturing the separated hematopoietic cells in a  
5 culture medium comprising a composition including a  
6 pharmaceutically acceptable carrier and a human flt-3 receptor  
7 agonist polypeptide comprising a modified flt-3 ligand amino acid  
8 sequence selected from the group consisting of:

9           (i)    the sequence of SEQ ID NO: 144; and

10          (ii)   a polypeptide comprising residues 1-132 of SEQ ID  
11                NO:144;

12 wherein the modification comprises the linear rearrangement of  
13 the sequences of (i) or (ii); wherein the N-terminus is joined to  
14 the C-terminus directly or through a linker capable of joining  
15 the N-terminus to the C-terminus and new C- and N-termini are  
16 created between the amino acid residue pairs of SEQ ID NO:144  
17 selected from the group consisting of:

18          28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

19          38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

20          87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

21          95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

22          and 102-103; and



23 wherein optionally the flt-3 receptor agonist polypeptide is  
24 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
25 (methionine<sup>-2</sup>, alanine<sup>-1</sup>); and  
26 (c) harvesting the cultured cells.

1           6.    A method for treatment of a patient having a  
2 hematopoietic disorder comprising the steps of:

3           (a)   removing hematopoietic cells from the patient;

4           (b)   culturing the separated hematopoietic cells in a  
5 culture medium comprising a human flt-3 receptor agonist  
6 polypeptide comprising a modified flt-3 ligand amino acid  
7 sequence selected from the group consisting of:

8           (i)    the sequence of SEQ ID NO: 144; and

9           (ii)   a polypeptide comprising residues 1-132 of SEQ ID  
10                 NO:144;

11 wherein the modification comprises the linear rearrangement of  
12 the sequences of (i) or (ii); wherein the N-terminus is joined to  
13 the C-terminus directly or through a linker capable of joining  
14 the N-terminus to the C-terminus and new C- and N-termini are  
15 created between the amino acid residue pairs of SEQ ID NO:144  
16 selected from the group consisting of:

17           28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,  
18           38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,  
19           87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,  
20           95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,  
21           and 102-103; and

22 wherein optionally the *flt-3* receptor agonist polypeptide is  
23 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
24 (methionine<sup>-2</sup>, alanine<sup>-1</sup>);

25 (c) harvesting the cultured cells; and

26 (d) transplanting the cultured cells into the patient.

1           7.    A method for treatment of a patient having a  
2 hematopoietic disorder comprising the steps of:

3           (a)   removing hematopoietic cells from the patient;

4           (b)   separating the hematopoietic cells from other cells;

5           (c)   culturing the separated hematopoietic cells in a  
6 culture medium comprising a human flt-3 receptor agonist  
7 polypeptide comprising a modified flt-3 ligand amino acid  
8 sequence selected from the group consisting of:

9           (i)    the sequence of SEQ ID NO: 144; and

10          (ii)   a polypeptide comprising residues 1-132 of SEQ ID  
11                   NO:144;

12 wherein the modification comprises the linear rearrangement of  
13 the sequences of (i) or (ii); wherein the N-terminus is joined to  
14 the C-terminus directly or through a linker capable of joining  
15 the N-terminus to the C-terminus and new C- and N-termini are  
16 created between the amino acid residue pairs of SEQ ID NO:144  
17 selected from the group consisting of:

18           28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

19           38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

20           87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

21           95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

22           and 102-103; and

23 wherein optionally the *flt-3* receptor agonist polypeptide is  
24 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
25 (methionine<sup>-2</sup>, alanine<sup>-1</sup>);

26 (d) harvesting the cultured cells; and

27 (e) transplanting the cultured cells into the patient.

1           8.    A method for treatment of a patient having a  
2 hematopoietic disorder, comprising the steps of:

3           (a)   removing hematopoietic cells from the patient;

4           (b)   culturing the hematopoietic cells in a growth medium  
5 comprising a human flt-3 receptor agonist polypeptide comprising  
6 a modified flt-3 ligand amino acid sequence selected from the  
7 group consisting of:

8           (i)    the sequence of SEQ ID NO: 144; and

9           (ii)   a polypeptide comprising residues 1-132 of SEQ ID  
10                 NO:144;

11 wherein the modification comprises the linear rearrangement of  
12 the sequences of (i) or (ii); wherein the N-terminus is joined to  
13 the C-terminus directly or through a linker capable of joining  
14 the N-terminus to the C-terminus and new C- and N-termini are  
15 created between the amino acid residue pairs of SEQ ID NO:144  
16 selected from the group consisting of:

17           28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

18           38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

19           87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

20           95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

21           and 102-103; and

22 wherein optionally the flt-3 receptor agonist polypeptide is  
23 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
24 (methionine<sup>-2</sup>, alanine<sup>-1</sup>);

25 (c) harvesting the cultured cells; and

26 (d) transplanting the cultured cells into the patient.

1           9.    A method for treatment of a patient having a  
2 hematopoietic disorder, comprising the steps of:

3           (a)   removing hematopoietic cells from the patient;

4           (b)   separating hematopoietic cells from other cells;

5           (c)   culturing the separated hematopoietic cells in a growth  
6 medium comprising a composition including a pharmaceutically  
7 acceptable carrier and a human flt-3 receptor agonist polypeptide  
8 comprising a modified flt-3 ligand amino acid sequence selected  
9 from the group consisting of:

10          (i)    the sequence of SEQ ID NO: 144; and

11          (ii)   a polypeptide comprising residues 1-132 of SEQ ID  
12                 NO:144;

13 wherein the modification comprises the linear rearrangement of  
14 the sequences of (i) or (ii); wherein the N-terminus is joined to  
15 the C-terminus directly or through a linker capable of joining  
16 the N-terminus to the C-terminus and new C- and N-termini are  
17 created between the amino acid residue pairs of SEQ ID NO:144  
18 selected from the group consisting of:

19          28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

20          38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

21          87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

22          95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

23          and 102-103; and



24 wherein optionally the flt-3 receptor agonist polypeptide is  
25 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
26 (methionine<sup>-2</sup>, alanine<sup>-1</sup>);

27 (d) harvesting the cultured cells; and

28 (e) transplanting the cultured cells into the patient.

1           10. A method of human gene therapy comprising the steps  
2 of:

3           (a) removing hematopoietic cells from a patient;

4           (b) culturing the hematopoietic cells in a growth medium  
5 comprising a human flt-3 receptor agonist polypeptide comprising  
6 a modified flt-3 ligand amino acid sequence selected from the  
7 group consisting of:

8           (i) the sequence of SEQ ID NO: 144; and

9           (ii) a polypeptide comprising residues 1-132 of SEQ ID  
10 NO:144;

11 wherein the modification comprises the linear rearrangement of  
12 the sequences of (i) or (ii); wherein the N-terminus is joined to  
13 the C-terminus directly or through a linker capable of joining  
14 the N-terminus to the C-terminus and new C- and N-termini are  
15 created between the amino acid residue pairs of SEQ ID NO:144  
16 selected from the group consisting of:

17           28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

18           38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

19           87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

20           95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

21           and 102-103; and

22 wherein optionally the flt-3 receptor agonist polypeptide is  
23 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
24 (methionine<sup>-2</sup>, alanine<sup>-1</sup>);

25 (c) transducing the cultured cells with DNA;

26 (d) harvesting the transduced cells; and

27 (e) transplanting the transduced cells into the patient.

1        11. A method of human gene therapy comprising the steps  
2 of:

3        (a) removing hematopoietic cells from a patient;  
4        (b) separating the hematopoietic cells from other cells;  
5        (c) culturing the separated hematopoietic cells in a growth  
6 medium comprising a human flt-3 receptor agonist polypeptide  
7 comprising a modified flt-3 ligand amino acid sequence selected  
8 from the group consisting of:

9        (i) the sequence of SEQ ID NO: 144; and  
10       (ii) a polypeptide comprising residues 1-132 of SEQ ID  
11       NO:144;

12 wherein the modification comprises the linear rearrangement of  
13 the sequences of (i) or (ii); wherein the N-terminus is joined to  
14 the C-terminus directly or through a linker capable of joining  
15 the N-terminus to the C-terminus and new C- and N-termini are  
16 created between the amino acid residue pairs of SEQ ID NO:144  
17 selected from the group consisting of:

18       28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,  
19       38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,  
20       87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,  
21       95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,  
22       and 102-103; and

1 wherein optionally the flt-3 receptor agonist polypeptide is  
2 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
3 (methionine<sup>-2</sup>, alanine<sup>-1</sup>);

4 (d) transducing the cultured cells with DNA;

5 (e) harvesting the transduced cells; and

6 (f) transplanting the transduced cells into the patient.

1        12. A method of human gene therapy comprising the steps  
2 of:

3        (a) removing hematopoietic cells from a patient;  
4        (b) separating the hematopoietic cells from other cells;  
5        (c) culturing the separated hematopoietic cells in a growth  
6 medium comprising a composition including a pharmaceutically  
7 acceptable carrier and a human flt-3 receptor agonist polypeptide  
8 comprising a modified flt-3 ligand amino acid sequence selected  
9 from the group consisting of:

10        (i) the sequence of SEQ ID NO: 144; and  
11        (ii) a polypeptide comprising residues 1-132 of SEQ ID  
12                NO:144;

13 wherein the modification comprises the linear rearrangement of  
14 the sequences of (i) or (ii); wherein the N-terminus is joined to  
15 the C-terminus directly or through a linker capable of joining  
16 the N-terminus to the C-terminus and new C- and N-termini are  
17 created between the amino acid residue pairs of SEQ ID NO:144  
18 selected from the group consisting of:

19        28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,  
20        38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,  
21        87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,  
22        95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,  
23        and 102-103; and

24 wherein optionally the flt-3 receptor agonist polypeptide is  
25 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
26 (methionine<sup>-2</sup>, alanine<sup>-1</sup>);

27 (d) transducing the cultured cells with DNA;

28 (e) harvesting the transduced cells; and

29 (f) transplanting the transduced cells into the patient.

1        13. A method of human gene therapy comprising the steps  
2 of:

3        (a) removing hematopoietic cells from a patient;  
4        (b) separating the hematopoietic cells from other cells;  
5        (c) culturing the separated hematopoietic cells in a growth  
6 medium comprising a composition including a pharmaceutically  
7 acceptable carrier and a human flt-3 receptor agonist polypeptide  
8 comprising a modified flt-3 ligand amino acid sequence selected  
9 from the group consisting of:

10        (i) the sequence of SEQ ID NO: 144; and  
11        (ii) a polypeptide comprising residues 1-132 of SEQ ID  
12                NO:144;

13 wherein the modification comprises the linear rearrangement of  
14 the sequences of (i) or (ii); wherein the N-terminus is joined to  
15 the C-terminus directly or through a linker capable of joining  
16 the N-terminus to the C-terminus and new C- and N-termini are  
17 created between the amino acid residue pairs of SEQ ID NO:144  
18 selected from the group consisting of:

19        28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,  
20        38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,  
21        87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,  
22        95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,  
23        and 102-103; and



24 wherein optionally the flt-3 receptor agonist polypeptide is  
25 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
26 (methionine<sup>-2</sup>, alanine<sup>-1</sup>);

27 (d) transducing the cultured cells with DNA;

28 (e) harvesting the transduced cells; and

29 (f) transplanting the transduced cells into the patient.

1        14. A method for the production of dendritic cells  
2 comprising the steps of:

3        (a) separating hematopoietic progenitor cells or CD34+  
4 cells from other cells; and

5        (b) culturing the hematopoietic progenitor cells or CD34+  
6 cells in a growth medium comprising a human flt-3 receptor  
7 agonist polypeptide comprising a modified flt-3 ligand amino acid  
8 sequence selected from the group consisting of:

9        (i) the sequence of SEQ ID NO: 144; and

10       (ii) a polypeptide comprising residues 1-132 of SEQ ID  
11 NO:144;

12 wherein the modification comprises the linear rearrangement of  
13 the sequences of (i) or (ii); wherein the N-terminus is joined to  
14 the C-terminus directly or through a linker capable of joining  
15 the N-terminus to the C-terminus and new C- and N-termini are  
16 created between the amino acid residue pairs of SEQ ID NO:144  
17 selected from the group consisting of:

18       28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

19       38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

20       87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

21       95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

22       and 102-103; and

23 wherein optionally the flt-3 receptor agonist polypeptide is  
24 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
25 (methionine<sup>-2</sup>, alanine<sup>-1</sup>).

1        15. The method of claim 14 further comprising the step of  
2        pulsing the culturing hematopoietic progenitor cells or CD34+  
3        cells with an antigen.

1        16. The method of claim 14 wherein the growth medium  
2        further comprises one or more factors selected from the group  
3        consisting of: GM-CSF, IL-4, TNF- $\alpha$ , stem cell factor (SCF), flt-  
4        3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein,  
5        and a multi-functional receptor agonist.

1        17. The method of claim 15 wherein the growth medium  
2        further comprises one or more factors selected from the group  
3        consisting of: GM-CSF, IL-4, TNF- $\alpha$ , stem cell factor (SCF), flt-  
4        3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein,  
5        and a multi-functional receptor agonist.

1        18. A method for treating a human having a tumor, infection  
2 or auto-immune disease comprising the step of administering a  
3 human flt-3 receptor agonist polypeptide comprising a modified  
4 flt-3 ligand amino acid sequence selected from the group  
5 consisting of:

6        (i)        the sequence of SEQ ID NO: 144; and

7        (ii)       a polypeptide comprising residues 1-132 of SEQ ID  
8                   NO:144;

9 wherein the modification comprises the linear rearrangement of  
10 the sequences of (i) or (ii); wherein the N-terminus is joined to  
11 the C-terminus directly or through a linker capable of joining  
12 the N-terminus to the C-terminus and new C- and N-termini are  
13 created between the amino acid residue pairs of SEQ ID NO:144  
14 selected from the group consisting of:

15        28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

16        38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

17        87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

18        95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

19        and 102-103; and

20 wherein optionally the flt-3 receptor agonist polypeptide is  
21 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
22 (methionine<sup>-2</sup>, alanine<sup>-1</sup>) to the human.

1        19. The method of claim 18 further comprising  
2        administering one or more factors selected from the group  
3        consisting of: GM-CSF, IL-4, TNF- $\alpha$ , stem cell factor (SCF), flt-  
4        3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein,  
5        and a multi-functional receptor agonist.

1        20. The method of claim 18 further comprising the step of  
2        administering an antigen to the patient.

1        21. The method of claim 19 further comprising the step of  
2        administering an antigen to the patient.

22. A method for treating a human having a tumor, infection or auto-immune disease, comprising the steps of:

(a) mobilizing dendritic cell progenitors or mature dendritic cells by administering a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or (methionine<sup>-2</sup>, alanine<sup>-1</sup>) to the human;

24           (b) removing the dendritic cell precursors or mature  
25 dendritic cells by a blood draw or pheresis;  
26           (c) pulsing the dendritic cell precursors or mature  
27 dendritic cells with an antigen; and  
28           (d) returning the antigen pulsed dendritic cell precursors  
29 or mature dendritic cells to the human.



1        23. The method of claim 22 further comprising administering  
2 in step (a) one or more factors selected from the group  
3 consisting of: GM-CSF, IL-4, TNF- $\alpha$ , stem cell factor (SCF), flt-  
4 3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein,  
5 and a multi-functional receptor agonist.

1        24. The method of claim 22 further comprising the step of  
2 culturing said dendritic cell precursors or mature dendritic  
3 cells from step (b) in a growth medium comprising the human flt-3  
4 receptor agonist polypeptide.

1        25. The method of claim 23 further comprising the step of  
2 culturing the dendritic cell precursors or mature dendritic cells  
3 from step (b) in a growth medium comprising the human flt-3  
4 receptor agonist polypeptide.

1        26. The method of claim 24 wherein the growth medium  
2 further comprises one or more factors selected from the group  
3 consisting of: GM-CSF, IL-4, TNF- $\alpha$ , stem cell factor (SCF), flt-  
4 3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein,  
5 and a multi-functional receptor agonist.

1        27. The method of claim 25 wherein the growth medium  
2 further comprises one or more factors selected from the group  
3 consisting of: GM-CSF, IL-4, TNF- $\alpha$ , stem cell factor (SCF), flt-  
4 3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein,  
5 and a multi-functional receptor agonist.

1        28. A method for treating a human having a tumor, infection  
2 or auto-immune disease comprising the steps of:

3        (a) removing hematopoietic progenitor cells or CD34+ cells  
4 from the human by a blood draw or pheresis;

5        (b) culturing the hematopoietic progenitor cells or CD34+  
6 cells in a growth medium comprising a human flt-3 receptor  
7 agonist polypeptide comprising a modified flt-3 ligand amino acid  
8 sequence selected from the group consisting of:

9        (i) the sequence of SEQ ID NO: 144; and

10       (ii) a polypeptide comprising residues 1-132 of SEQ ID  
11 NO:144;

12 wherein the modification comprises the linear rearrangement of  
13 the sequences of (i) or (ii); wherein the N-terminus is joined to  
14 the C-terminus directly or through a linker capable of joining  
15 the N-terminus to the C-terminus and new C- and N-termini are  
16 created between the amino acid residue pairs of SEQ ID NO:144  
17 selected from the group consisting of:

18       28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

19       38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

20       87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

21       95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

22       and 102-103; and

23 wherein optionally the flt-3 receptor agonist polypeptide is  
24 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
25 (methionine<sup>-2</sup>, alanine<sup>-1</sup>) to produce dendritic cell precursors or  
26 mature dendritic cells; and

27 (c) returning the dendritic cell precursors or mature  
28 dendritic cells to the human.

1        29. A method for treating a human having a tumor, infection  
2 or auto-immune disease comprising the steps of:

3        (a) removing hematopoietic progenitor cells or CD34+ cells  
4 from the patient by a blood draw or pheresis;

5        (b) culturing the hematopoietic progenitor cells or CD34+  
6 cells in a growth medium comprising a human flt-3 receptor  
7 agonist polypeptide comprising a modified flt-3 ligand amino acid  
8 sequence selected from the group consisting of:

9        (i) the sequence of SEQ ID NO: 144; and

10       (ii) a polypeptide comprising residues 1-132 of SEQ ID  
11 NO:144;

12 wherein the modification comprises the linear rearrangement of  
13 the sequences of (i) or (ii); wherein the N-terminus is joined to  
14 the C-terminus directly or through a linker capable of joining  
15 the N-terminus to the C-terminus and new C- and N-termini are  
16 created between the amino acid residue pairs of SEQ ID NO:144  
17 selected from the group consisting of:

18       28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38,

19       38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87,

20       87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95,

21       95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102,

22       and 102-103; and

23 wherein optionally the flt-3 receptor agonist polypeptide is  
24 immediately preceded by (methionine<sup>-1</sup>), (alanine<sup>-1</sup>) or  
25 (methionine<sup>-2</sup>, alanine<sup>-1</sup>) to produce dendritic cell precursors or  
26 mature dendritic cells;

27 (c) pulsing the dendritic cell precursors or mature  
28 dendritic cells with an antigen; and

29 (d) returning the antigen pulsed dendritic cell precursors  
30 or mature dendritic cells to the human.

1        30. The method of claim 28 further comprising the step of  
2 separating the hematopoietic progenitor cells or CD34+ cells from  
3 other cells prior to culturing.

1        31. The method of claim 29 further comprising the step of  
2 separating the hematopoietic progenitor cells or CD34+ cells from  
3 other cells prior to culturing.

1        32. The method of claim 28 wherein the culture medium  
2 further comprises one or more factors selected from the group  
3 consisting of: GM-CSF, IL-4, TNF- $\alpha$ , stem cell factor (SCF), flt-  
4 3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein,  
5 and a multi-functional receptor agonist.

1        33. The method of claim 29 wherein the culture medium  
2 further comprises one or more factors selected from the group  
3 consisting of: GM-CSF, IL-4, TNF- $\alpha$ , stem cell factor (SCF), flt-  
4 3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein,  
5 and a multi-functional receptor agonist.

1        34. The method of claim 30 wherein the culture medium  
2 further comprises one or more factors selected from the group  
3 consisting of: GM-CSF, IL-4, TNF- $\alpha$ , stem cell factor (SCF), flt-  
4 3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein,  
5 and a multi-functional receptor agonist.

1        35. The method of claim 31 wherein the culture medium  
2 further comprises one or more factors selected from the group  
3 consisting of: GM-CSF, IL-4, TNF- $\alpha$ , stem cell factor (SCF), flt-  
4 3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein,  
5 and a multi-functional receptor agonist.